THE MODERN OPERATIVE TREATMENT OF TUBERCULAR JOINT AFFECTIONS.

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WE owe to Koch the knowledge that tuberculosis, whether in the lungs, the meninges or in the joints. is produced by the colonization and growth of a specific bacillus. The slow progress of the disease, its well known tendency to coagulation—necrosis, caseation and emulsification, which lead to more or less extensive destruction of tissue and the formation of cold abscesses, were well noted by surgeons even before the true cause of these phenomena was appreciated. It is not within the scope of this paper to discuss the measures of prevention or cure of joint tuberculosis, known under the comprehensive name of orthopædics, although the separation of the orthopædic, and more strictly speaking, surgical treatment of this affection, is unnatural and illogical. They do not antagonize, but rather supplement each other.

Yet I wish to call attention to two aids of anti-tubercular therapy, preventive and curative, that do not receive the attention they amply deserve.

The first of these is the ice-bag. Aside from fixation and rest, I do not know any therapeutical measure that affords more comfort to the patient than a methodical and properly graduated process of refrigeration of the hot and tender joint afflicted with tuberculosis. But, aside from this, numerous instances in my experience have demonstrated the fact that the progress of the disease has been frequently retarded, or even completely arrested by the prolonged use of dry refrigeration combined with rest in such joints as the knee and elbow, for instance, which are amenable to an energetic application of cold. The hip joint, buried under a great mass of highly vascularized muscular tissue, does not offer as good conditions for thorough cooling as the knee and elbow.

The beneficial effects of the prolonged application of cold to tuberculous joints, especially in cases belonging to the group of purely synovial tuberculosis, have been correctly appreciated by most erman surgeons, such, for instance, as Volkmann, Esmarch and Kœnig; but credit for rational explanation of this fact is due to the efforts of Koch, who has demonstrated by experiment the extraordinary sensitiveness of the bacilli of tuberculosis to slight variations of the temperature of the soil in which they grow. A depression of the temperature of the culture soil by two centigrades below the normal human standard was invariably sufficient to arrest the propagation of the bacillus.

It is to be added that such a lowering of the temperature of the medium within which tubercle-bacilli thrive, does not kill the spores or seed of the fungus; it only arrests further propagation, that is, brings about an arrest of growth. Thus, during the pause of growth of the noxious elements, time is afforded to strengthen the general power of resistance of the organism by proper diet and medication, and the healthy tissues have a chance to throw up around the focus of disease a protective, encapsulating wall of granulation-, or ultimately of dense connective tissue.

The other form, of curative and preventive therapy, deserving assiduous study and cultivation. *consists in the early ferreting out and surgical evacuation of tuberculous cheesy foci* located in the epiphyses of the bones entering into the formation of this or that joint. It is well known that almost all cases of infantile joint-tuberculosis are produced by the extension of the specific process to the joint by perforation from adjacent osseal foci.

Space does not permit me to quote pertinent histories from my own, and from the experience of other surgeons; but it stands to reason, that if such a focus is diagnosticated and evacuated *before* its extension to the joint, a truly conservative step will have been taken by the surgeon, who thus by one stroke prevents the involvement of the joint. Many of these foci are located superficially, and can be easily diagnosed, exposed and emptied of their contents of cheesy matter and sequestra. Our means for the exploration of deep-seated foci are less satisfactory; but surgical ingenuity will not fail to produce a safe and satisfactory way of ascertaining the presence and exact location of these deep-seated foci, as soon as the importance of this plan of treatment and its high prophylactic value will be fully appreciated. I intend to bring my endeavors in this direction to your notice at the proper time.

The measures here advocated, that is the early exploration of diseased epiphyses, and the evacuation of tuberculous foci threatening perforation into an adjacent joint, are, if properly managed, free from great dangers, both as regards hemorrhage and suppuration, and are excellently borne by the patients.

Before entering upon the consideration of the operative therapy of joint-tuberculosis it is necessary to draw the limits, at which the orthopædist's efforts cease to be useful, and beyond which operative aid is required.

For purely practical reasons all cases of manifest joint affection must be divided in two classes: those of adults, and those of children.

The majority of tuberculous joint-affections in *adults* occur among the poor, the illy housed and insufficiently nourished, many of whom are found at the same time to be afflicted with lung trouble. A strictly orthopædic treatment of these cases, especially of those in which the lower extremity is involved is mostly impracticable or even impossible, as the patients lack the means for defraying the cost of their maintenance and of apparatus. And even if apparatus is procured, the strain of the weight of the adult body upon the apparatus is so great that much more repairing and tinkering is needed than would be the case in similar affections of children.

There are yet no institutions for the reception and orthopædic treatment of these cases, and a poor laborer afflicted with a chronic tubercular complaint of the knee-joint, for instance, will have to pass through a long experience of neglect and suffering until his own common sense will urge him to beg for an operation. If admitted to a hospital, the hackneyed series of time-honored but useless remedies will be invariably inflicted upon him. Zealous members of the house-staff will not heed his protests, and will unswervingly put the limb into a plaster case, will poultice, will blister and finally will try the actual cautery, all to no purpose, as others have done before them. Finally, the patient will be discharged "improved," to wend his weary way to another hospital. Ultimately, a cold abscess will form. It will perforate outward or will be incised. Some neglect of the antiseptic precautions at or after the time of the opening of the abscess will lead to pyogenic infection of the soil already ravaged by the inroads of tuberculosis, and acute destructive suppuration will be superadded to the slow process of decay inaugurated by the bacillus of tuberculosis. New abscesses and sinuses developing, the patient's general condition will become so lowered that amputation, as a life-saving measure, will become imperative.

This is the typical and sad course of these cases, as all can attest, and in view of these facts the question must be raised: Is there no way of shortening the patient's endless misery? The answer is and must be—yes, there is, *by early exsection.*

By exsecting the tuberculous hip, knee or ankle joint of an adult, we cut short a long and painful illness. and often reclaim the patient from humiliation and beggary to usefulness and life's enjoyment. Besides, it is an undeniable fact that the results of operations performed on the adult before the establishment of sinuses are infinitely, better and that cures are accomplished much more quickly than in the presence of an extensive destruction of the soft and bony tissues.

The indications for the operative treatment of chronic joint affections of the upper extremities of adults are less stringent; but even here great weight must be accorded to external circumstances, such as inability to earn a livelihood, steady deteroration of health and "morale," in determining the surgeon to operate early. The noteworthy decline of the rate of mortality after joint exsections, brought about by antiseptics, clearly justifies this course.

To sum up we may say that *in tuberculous affections of the joints of adults in poor circumstances, especially those of the lower extremity, early operations are indicated and justified; total or* *typical exsections deserving the preference, as a rapid and lasting cure is most desirable.*

In children matters stand somewhat differently. First of all must be mentioned the fact that the hygienic and general treatment aimed at the improvement of the health of the little patients commonly receives all the desirable care and attention on the part of anxious and loving parents, whose devotion to the welfare of their children is the surgeon's most welcome ally in combating disease. Furthermore, the orthopædic treatment proper is much easier than in adults on account of the lesser size and weight of the infantile body. Hence, in all cases general and orthopædic treatment should be first instituted and carried on as long as possible. Many cases will prosper under the eye and hand of a vigilant and careful practitioner, terminating in ultimate recovery.

In a large proportion of cases no abscess will develop. Should this occur, the abscess should not be incised, but rather tapped, evacuated and injected with a solution of iodoform in ether (5 : 100). If the abscess refill, this may be repeated several times till involution be manifest.

In tapping, but especially while injecting cold abscesses, the utmost care should be paid to antiseptics, as disregard of these cautelæ may lead to infection and acute septic suppuration of the cavity. The strictest attention must be paid to the disinfection of the trocar canula, which should be effected by prolonged boiling or better still by passing the intrument through the alcohol flame.

Should all these measures prove to be of no avail, either on account of the virulence of the disease or because of the disregard of the directions of the physician, or the negligence or incapacity of the parents, and the development and perforation of abscesses or inexhaustible and profuse suppuration lead to marked loss of power and general deterioration, operative treatment will be in order.

The modern principles governing the exsection of tuberculous joints differ in many respects from those that obtained before the advent of antiseptic surgery.

The first and most important rule is embodied in the necessity of conscientiously removing all tissues, soft and osseous, that are *found to be manifestly diseased, or even morbidly altered.* We have to deal with tuberculous tissues as though they were cancerous.

In the joint affections of adults, generally belonging to the synovial type, where the cartilaginous covering of the epiphyses will usually be found destroyed and the articular surfaces carious, the synovial capsule intumescent and containing cheesy deposits, total or typical exsections will be required to insure a complete removal of all diseased tissues.

In children, where the articular trouble is mainly local, that is, circumscribed or limited to certain portions of the joint, only those parts should be removed that are actually diseased. Observance of this rule is very desirable on account of the arrest of growth invariably following whenever the epiphyseal cartilage is sacrificed in total exsections of certain joints as, for instance, the knee. Partial or atypical exsections of infantile joints yield excellent results under an aseptic management, and are universally recommended and practiced. The capsule, however, should be always completely exsected.

The scrupulous observance of the rules of aseptic and antiseptic practice is now generally conceded to be a prime condition of the safe performance of joint exsection. Pyogenic, that is, acute suppurative infection will be thus excluded with great certainty from the wound, and the rapidity of cure and excellence of the final result will be proportionate to the success of the surgeon to maintain asepticism.

Wölfler has demonstrated, that while Esmarch's bandage is *in situ*, no absorption whatever can take place centerward from the wound through the injured veins and lymphatics. Hence, it is perfectly safe to continuously irrigate the exsection wound even with strong solutions of corrosive sublimate, as long as the constricting band remains attached. In the hip and shoulder joints, where Esmarch's bandage cannot be applied, irrigation by a continuous stream of Thiersch's solution (boro-salicylic lotion) is still more necessary.

But another form of infection, that by dissemination of the tuberculous virus from the wound throughout the general circulation, directly produced by the mechanical efforts connected with the operation itself, has to be also sedulously guarded against. *Kœnig* has aptly dubbed this form of infection as the *"operative dissemination of tuberculosis."*

Whenever Esmarch's bandage can be used, the possibility of the absorption of tuberculous material detached by the scoop or knife is safely precluded. In the shoulder and hip joints, however, special precautions must be taken.

First of all the employment of rough force by excessive pressure by means of retractors, the use of blunt methods of preparation where clean work with the knife is preferable or admissible, in short, all vigorous manipulations are to be avoided. Ample incisions will obviate the necessity for this too forcible and injurious way of exposing the parts to be operated on. The knife should be relied upon to divide resistant tissues, and the elevator should not be used for anything except the peeling up of the periosteum, where it is loosely attached to the subjacent bone. Whenever the scoop is used in removing granulations, carious bone or cheesy matter, a continuous and lively jet of irrigating fluid should at once wash away detritus thus detached.

The next point of great importance to be considered in connection with the subject of joint exsection is that of the *control of the hemorrhage.* The use of Esmarch's bandage is universally accepted on account of its great advantages; but a few remarks made in reference to the special way of securing all advantages of Esmarch's apparatus in performing exsections may not be amiss.

The expulsion of blood from the limb by means of the application of an elastic roller bandage previous to the adjustment of the constricting band (in place of the tourniquet) is not only unnecessary, but even injurious. The expulsion of all blood from the limb robs the surgeon of a ready means of recognizing and deligating all, even the smallest bloodvessels, as soon as they are cut. On the other hand, if the limb is depleted only to such an extent as will be brought about by vertical elevation preceeding the application of the constricting band, two advantages will be secured: First, no infectious matter will be driven into the circulation by the forcible pressure of the elastic band; and secondly, the effusion of a small quantity of blood will readily serve to locate the place where a vessel had been injured, the hemorrhage, there being no *vis a tergo* present to propel the column of blood, will be minimal, as atmospheric pressure safely prevents the escape of any contents of the bloodvessels, except those that are to be found in the immediate vicinity of the aperture made in the vessel by the surgeon.

As soon as the operation is completed the wound is united by catgut sutures; when there are a number of sinuses that can be utilized as drainage holes, no drainage tubes need be inserted. Where no sinuses exist, one or two short pieces of rubber tubing should be placed just within the wound cavity.

After a final flushing out of the wound, a strip of well disinfected rubber tissue protective is placed over the line of union, and the joint is enveloped in a compress of iodoformized gauze and an ample mass of corrosive sublimate dressings held down by a sufficient number of rather tight, compressive turns of a gauze bandage. Support of the limb is derived from a pasteboard—veneer—or plaster of Paris splint.

While the limb is held vertically, Esmarch's band is removed, whereupon the return of circulation is announced by the bright pink flush which is seen to overspread the exposed parts of the limb. As long as this hyperæmia is seen to exist, the vertical posture of the limb must be maintained by support or suspension. As soon as the toes or fingers resume their natural color, the extremity can be brought into the horizontal position.

Should blood be seen to penetrate the dressings, Martin's elastic bandage is to be applied to serve the purpose of additional compression. In two or three hours, when coagulation of the effused blood may be safely assumed, the elastic bandage and, when needs be, the external parts of the antiseptic dressing are to be removed and the latter renewed.

I have used this method for the control of hemorrhage since 1877, and never in any case had to regret its employment.

In exsections of the shoulder and hip joints, the impossibility of taking advantage of Esmarch's band will necessarily modify our procedure. Every vessel must be secured here, if possible, before, or at least immediately after it is cut. As the extent of the wound is large, and the oozing profuse, further loss of blood must be checked by tight packing with iodoformed gauze, which at the same time will serve as drainage. Silver wire or silkworm gut sutures should be made, but left unknotted. After this the joint is to be dressed as usual. Three days after the operation the packing is withdrawn with or more commonly without the aid of an anæsthetic, and the sutures being knotted and thus the edges of the wound approximated; the wound is enveloped in a dry antiseptic dressing. Primary union of the contiguous surfaces follows then almost without exception. The credit for devising this form of secondary suture belongs to Kocher of Berne.

The *after-treatment* of exsection wounds is, in the main, determined by the question: *Is mobility or ankylosis desirable in a given case?*

Where, as for instance in the *knee-joint*, firm, bony ankylosis is aimed at, the first dressings and splint should remain undisturbed, if possible, for at least three or four weeks. My rule was heretofore to remove the first dressings on or about the thirtieth day after the operation. Then the nails or wires used for fixation should be withdrawn, and a light, preferably a silicate of soda, splint should be applied over the dressings protecting the remaining apertures. The patient should be directed at once to walk about on crutches, as experience has shown that a tardy process of ossification at the site of the bony union is hastened by this gentle mode of irritation.

The hip joint, in which a short, firm ligamentous union, permitting a limited amount of mobility, is considered as the most desirable result after exsection, will also have to be maintained in a long continued state of rest. Buck's weight extension in a moderately abducted position is the most convenient one. Eight, ten or even twelve or more weeks of rest are necessary; at any rate, locomotion must not be permitted, as a rule, as long as fistulæ remain. As soon as the wound is firmly healed the patient may begin to walk with the support of a Taylor's splint, which is to prevent the displacement upward of the trochanter so often marring the final functional result, when this precaution is regarded. The wearing of some apparatus for at least a year after the operation is generally considered necessary except in cases of manifest bony ankylosis.

At night, weight extension with abduction is to be maintained also for some time, say for a period of from three to six months, or at least as long as any tendency to the reassumption of a vicious position in *adduction* or flexion upon the pelvis is visible.

In the *elbow*, where normal mobility is aimed at, absolute fixation by splint should continue only until the drainage tubes are withdrawn, and the incisions are firmly healed. *Passive*, but especially *early passive motions*, so warmly recommended by older authors, *are harmful*, and not be compared as regards their value with *active exercises*.

The disadvantages of early passive motions can be summed up in this: Before the re-establishment of the normal condition of the tissues pertaining to an exsected joint—that is, before the disappearance of the swelling and rigidity of the soft parts—all motions, active and passive, will be painful. Active motions, however, will be limited to a harmless compass by the pain forbidding extensive movements; but passive motions, done without regard to the pain and struggles of the resisting patient, will be, and as a matters of fact, often are carried far beyond the limits of harmlessness. The forcible stretching and crushing together of the rigid and succulent, newly formed connective tissue are inevitably followed by minute ruptures and lacerations. Renewed extravasation and exudation and a diffuse state of adhesive inflammation are set up, which will cause the persistence or even an increase of the painful swelling and induration primarily present about the exsected joint. The greater the surgeon's energy, the worse the result, and in many cases ankylosis is brought on by the very measures intended to prevent it.

If, on the other hand, the surgeon patiently awaits the time of spontaneous detumescence, which with antiseptic measures and fixation, will occur at about the fourth or fifth week after the operation, gentle motions will cause no pain, and will encourage the patient to active exercise of the joint. The pain felt on excessive movement will serve as a wholesome check against undue zeal; the improvement of nutrition due to active exercise, will hasten the definitive involution of the inflammatory products. Thus, day by day will the strength and amplitude of the active movements be increased, and by dint of painless attrition new articular surfaces will be ground and polished into shape. Massage and faradism, have to do their part in augmenting the nutrition and strength of the atrophied muscles, and if, on account of great loss of bone, lateral mobility is excessive, a properly constructed angular, articulating splint should confine the motion to one plane.

Many more details of great practical importance have to be observed in aiming at a good final result after joint exsection; but I must content myself with a bare outline of the principles that govern our efforts in this direction.

Before concluding my remarks I must not omit to mention a procedure now generally known under the name of *revision* that by common acceptance has crystallized into the term by which all complementary or subsidiary steps are understood, which may, and often do become necessary to bring exsection to its complete and final result or cure. Formerly exsection wounds were considered to be "healed," although one or more sinuses persisted; now-a-days the professional standard has been raised to the truer and better one of the layman professing common sense, who refuses to consider a wound "healed" as long as it continues to discharge.

In exsections practised on children especially, relapses in the wound of the tubercular process are very frequent on account of the surgeon's desire to preserve as much as possible of the joint. Small particles of diseased tissue being thus left behind, the discharges are contaminated, and often the whole wound surface becomes reinfected by tuberculosis. The exuberant deciduous granulations visible at the margins of the persistent sinuses, and the flocculent, thin discharges announce the fact within three weeks after the operation. A vigorous exhibition of the scoop under full anæsthesia, repeated if needs be every ten days, will soon terminate the process. The wounds will contract more rapidly, and the final healing will be much hastened by one or more of these harm and dangerless supplementary operations.

In cases exhibiting a condition of widespread destruction of the tissues, in which exsection being tried as a forlorn hope suppuration with continued fever and hectic follow, amputation should not be delayed until amyloid changes of liver and kidneys render the chances of final recovery very doubtful.

NOTES ON WRY-NECK AND ITS TREATMENT.

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THERE is a certain ambiguity about the term "wry-neck" as about many other terms in the nomenclature of disease. A name is given to a roughly defined group of symptoms, or, perhaps, to one well-marked symptom, Time and observation differentiate several distinct, perhaps vitally distinct and contrasted, pathological conditions at the bottom of different cases respectively. If a minority of cases are found to depend on a disease far more serious than the original symptom which has attracted attention, there will be a tendency to cease to view such cases after the mere symptom, and to associate them rather with other cases of the primary disease. Hence there are few surgeons whe now follow the old-fashioned practice of speaking of a case of cervical caries as a form of wry-neck.

Again, when, from its comparative commonness, its intrinsic interest, and the regularity of its symptomatology, one particular pathological condition seems to demand a distinct name all to itself, it is apt to arrogate to itself exclusively the name which, in time of vague pathology, it shared with other conditions different essentially, though similar superficially.

For these reasons, contracture of the sterno-mastoid is coming more and more to be regarded as the only affection having a thorough claim to be called "wry-neck"; and even cicatricial contractions of the skin after burns, whatever may be the po-